

**AMENDMENTS TO THE CLAIMS**

1. – 33. (Canceled)

34. (Currently Amended) The system as claimed in ~~claim 32, claim 85~~, wherein the system is a fluid network formed in a substrate,

~~wherein the at least one conductive member being conducting means is disposed in a-the segment of said microchannel and the electrical connection means comprises electrodes being positioned to apply an-the electric field across the segment, and wherein the space between the conductive member conducting means and the walls of the microchannel, and between different conductive membersconducting means, is between 0 a<sub>char</sub> and 2 a<sub>char</sub>, the surface of the at least one conductive memberconducting means being smooth such that the surface irregularities are less than 5% of d<sub>char</sub>.~~

35. (Currently Amended) The system as claimed in claim 34, wherein the space between the ~~conducting member~~ conducting means and the channel walls, and between different ~~conducting members~~ conducting means, is between 1/8 a<sub>char</sub> and 1/2 a<sub>char</sub>, and wherein the surface irregularities are less than 1% of d<sub>char</sub>.

36. (Currently Amended) The system as claimed in claim 34, wherein the ~~at least one~~ conducting member conducting means has the shape of an ellipsoid, sphere, cylinder or elliptical cylinder.

37. (Currently Amended) The system as claimed in claim 34, wherein the ~~at least one~~ conducting member conducting means consists of a small cylinder with the longitudinal axis normal with respect to the fluid flow direction.

38. (Currently Amended) The system as claimed in claim 34, wherein the ~~at least one conducting member~~ conducting means has the shape of a particle with planes which are inclined with respect to the imposed electric field.

39. (Currently Amended) The system as claimed in claim 38, wherein the particle constituting the ~~electrically conducting member~~ conducting means has a size of 0.1  $\mu\text{m}$  - 5 mm, measured in parallel to the externally imposed electric field.

40. (Currently Amended) The system as claimed in claim 39, wherein the particle constituting the ~~conducting member~~ means has a size of 1.0  $\mu\text{m}$  to 500  $\mu\text{m}$  measured in parallel to the externally imposed electric field.

41. (Previously Presented) The system as claimed in claim 38, wherein the angle  $\lambda$  between the inclined surface portion and the microchannel walls is 1- 80 degrees.

42. (Previously Presented) The system claimed in claim 41, wherein, the angle  $\lambda$  between the inclined surface portion and the microchannel walls is 30 - 60 degrees.

43. (Currently Amended) The system claimed in claim 34, wherein the ~~conducting member~~ means contains several layers of conducting particles, spaced both axially and longitudinally in relation to the flow direction.

44. - 46. (Canceled)

47. (Currently Amended) The system claimed in claim 34, wherein the ~~conducting member~~ means has a conductivity of at least 5 times the conductivity of said fluid.

48. (Currently Amended) The system claimed in claim 47 wherein the ~~conducting member~~ means has a conductivity of at least 10 times the conductivity of said fluid.

49. (Previously Presented) The system as claimed in claim 34, wherein the electrodes are arranged upstream or downstream with respect to the microchannel segment.

50. (Currently Amended) The system as claimed in claim 34, wherein the electrodes are adapted to provide an electrical field parallel to the direction of the transported fluid.

51. (Previously Presented) The system as claimed in claim 34, wherein the electrodes are arranged to apply an alternating field.

52. (Previously Presented) The system as claimed in claim 34, wherein the electrodes are arranged to apply an alternating field which has sine, square, triangular or sawtooth shape, or a combination of said shapes.

53. (Previously Presented) The system as claimed in claim 34, wherein the electrodes are arranged to apply an alternating field where the signal has an offset resulting in a strong and a weak pulse within the signal period, and also a duty - cycle of 29%, so that the strong pulse lasts 29% of the signal period, and where the offset and duty cycle are tuned to give a zero average direct electric signal component.

54. (Previously Presented) The system as claimed in claim 34, wherein the electrodes are arranged to apply an alternating field where the signal has an overloaded direct component.

55. (Previously Presented) The system as claimed in claim 34, wherein the electrodes are arranged to apply an alternating field where the electric signal is applied in the potentiostatic regime.

56. (Previously Presented) The system as claimed in claim 34, wherein the electrodes are arranged to apply an alternating field with a maximum amplitude in V/mm equal to or larger than

an amplitude for which the base -10- logarithm is the linear interval between -2 and 2, for corresponding  $a_{char}$ , measured in  $\mu\text{m}$ , for which the base -10- logarithm is in the linear interval between 0 and 3.7.

57. (Previously Presented) The system as claimed in claim 34, wherein the electrodes are arranged to apply an alternating field with a signal period in seconds equal to or larger than a period for which the base -10 - logarithm is in the linear interval between -6 and zero, for corresponding  $a_{char}$ , measured in  $\mu\text{m}$ , for which the base -10 - logarithm is in the linear interval between 0 and 3.

58. (Previously Presented) The system as claimed in claim 34, wherein the electrodes are arranged to apply a direct electric field.

59. (Currently Amended) The system as claimed in claim 34, wherein the distance between each electrode and the conducting ~~member~~means is between 0.1 and 5 mm.

60. (Previously Presented) The system as claimed in claim 34, wherein the electrodes comprise four electrodes, a first pair of electrodes for inducing the SCR, and a second pair of electrodes for setting ions in the fluid in motion.

61. (Previously Presented) The system as claimed in claim 60, wherein a first pair of electrodes is arranged upstream or downstream of said segment of the microchannel, anywhere in the microchannel or microfluidic system, and wherein the second pair of electrodes is positioned on each side of said segment.

62. (Previously Presented) The system as claimed in claim 60, wherein the first pair of electrodes and the second pair of electrodes each applies an alternating electric field, where the two electric fields are out of phase.

63. (Currently Amended) The system as claimed in claim 34, wherein the conducting ~~member means~~ is a portion of the microchannel wall effecting a deflection of the local electrical field so that the field is inclined with respect to the conducting ~~member means~~.

64. (Currently Amended) The system as claimed in ~~claim 32, claim 85~~, arranged to act as a micropump.

65. (Currently Amended) The system as claimed in ~~claim 32, claim 85~~, arranged to act as a mixer.

66. (Currently Amended) The system as claimed in ~~claim 32, claim 85~~, arranged to provide drug delivery.

67. (Previously Presented) The system as claimed in claim 64, wherein the system is part of a lab-on-a chip assembly.

68. (Previously Presented) The system as claimed in claim 64, arranged to provide electronics cooling.

69. (Canceled)

70. (Currently Amended) The method as claimed in ~~claim 69, claim 86~~, wherein said electric field is an asymmetric alternating field.

71. (Previously Presented) The method as claimed in claim 70, wherein, with one polarity, said electric field is insufficient to cause fluid to flow as a result of secondary electroosmosis.

72. (Previously Presented) The method as claimed in claim 71, wherein a time integral of said electric field is zero.

73. (Currently Amended) A method for pumping fluid in a microchannel wherein said microchannel is in a microfluidic system as claimed in ~~claim 32~~ claim 85.

74. (Canceled)

75. (Currently Amended) A system as claimed in ~~claim 74~~ claim 87, wherein the characteristic dimension of the ~~conductive member~~ conducting means is between 10 $\mu$ m and 500  $\mu$ m.

76. (Currently Amended) A system as claimed in ~~claim 74~~ claim 87, wherein the minimum diameter of the flow passage is between 1/16 and 1 times the characteristic dimension of the said ~~conductive member~~ conducting means.

77. (Currently Amended) A system as claimed in ~~claim 74~~ claim 87, wherein the surface of the said ~~conductive member~~ conducting means is smooth such that any surface irregularities are less than 5% of the characteristic dimension thereof.

78. (Currently Amended) A system as claimed in ~~claim 74~~ claim 87, wherein the surface of the ~~conductive member~~ conducting means is at an angle of between 30 and 60 degrees to the direction of the electric field.

79. (Currently Amended) A system as claimed in ~~claim 74~~ claim 87, wherein the ~~conductive member~~ conducting means has a conductivity of at least 5 times that of a liquid which in use is to flow in the microfluidic system.

80. (Currently Amended) A system as claimed in ~~claim 74~~ claim 87, wherein the microfluidic system is arranged on or in a substrate.

81. (Currently Amended) A system as claimed in ~~claim 74, claim 87, wherein the electrical connection means comprises a pair of electrodes respectively arranged upstream and downstream with respect to the microchannel segment, and~~

wherein the distance between each electrode and the said ~~conductive member~~ conducting means is between 0.5 and 5 mm.

82. (Currently Amended) A system as claimed in ~~claim 74~~ claim 87, wherein the microchannel has an inlet and an outlet, and the pump is arranged to cause fluid to flow from the inlet, along the microchannel and adjacent to said surface of the ~~conductive member~~ conducting means, to the outlet.

83. (Currently Amended) A method for pumping fluid in a microchannel wherein said microchannel is in a microfluidic system as claimed in claim 74, the method comprising applying said electric field to cause fluid to flow under the action of secondary electroosmosis.

84. (Currently Amended) A method as claimed in claim 83, wherein ~~the electrodes apply~~ an electric field  $E$  is applied to said member, and wherein

$$E > 0.013 \text{ V} / a_{\text{char}}$$

where  $V$  is the potential drop across the characteristic dimension of the ~~conductive member~~ conducting means and  $a_{\text{char}}$  is 0.5 times the characteristic dimension.

85. (New) A microfluidic system comprising:

a microchannel;

a pump; and

electrical connection means for application of an electric field across a segment of said microchannel,

wherein said segment comprises conducting means,  
wherein the conducting means comprises a perm selective ion conducting material, and  
wherein a surface portion of said conducting means is curved, or inclined, with respect to  
the electrical field, whereby, in use, the electric field has a component tangential to the surface  
portion and a component normal to the surface portion, such that fluid flow is induced in said  
microchannel segment under the action of secondary electroosmosis.

86. (New) A method for pumping fluid in a microchannel comprising:  
the step of applying an electric field to a segment of the microchannel, the segment  
comprising:

conducting means, the conducting means comprising a perm selective ion conducting  
material and having a surface portion which is curved or inclined with respect to the electric  
field, whereby the electric field has a component tangential to the surface portion and a  
component normal to the surface portion, to cause fluid in said microchannel segment to flow as  
a result of secondary electroosmosis.

87. (New) A system as claimed in claim 85, wherein the conducting means has a  
characteristic dimension which is its dimension measured parallel to the electric field and which  
is at least 10 $\mu$ m, and wherein a flow passage is defined between said surface portion of the  
conducting means and another conducting means or between said surface portion and a portion  
of the wall of said microchannel, the flow passage having a minimum diameter of at least 1/16 of  
the characteristic dimension of said conducting means.